

REMARKS

Claims 1-16 are currently pending in this application. Favorable reconsideration and allowance is respectfully requested.

The claims are rejected and objected to based on various cited prior art, including Weinstein et al (6,902,590), Tran et al (6,602,112), Antonell et al (6,899,596), Minamihaba et al (6,858,539), and Tseng (6,455,428). It is believed the following remarks and arguments, and the foregoing amendments, will overcome these objections and rejections. It is also noted with appreciation that claims 9 and 13 are considered allowable if rewritten in independent form.

Claims 1 and 12 stands rejected as being obvious over Weinstein (USP 6,902,590) in view of Tran (USP 6,602,112). Claim 14 recites The Examiner contends Weinstein shows a method of CMP comprising an allyloxylbenzenesulfonic acid /organosulfonic oxidizer, said organosulfonic acid having a ring structure comprising carbon, the allyloxylbenzenesulfonic acid comprising a moiety. The Examiner notes Weinstein fails to disclose an allyloxylbenzenesulfonic acid /organosulfonic acid which comprises a sulfonated moiety onto a carbon in the ring structure, and a polar moiety substituted onto the ring in an ortho or meta position.

The Examiner contends Tran discloses that sulfonic acid comprises acid moiety substituted onto a carbon ring structure, and a polar moiety substituted on the ring structure in on an ortho position from the sulfonate moiety. The Examiner further contends one skilled in the art at the time the invention was made would have found it obvious that Weinstein's allyloxylbenzenesulfonic acid /organosulfonic acid having a sulfonic acid substituted on a ring structure, and a polar moiety substituted on the ring in an ortho position from the sulfonate moiety in view of Tran's disclosure of species having two acid species present in a structure. Applicants respectfully traverse.

Weinstein is directed toward the use of certain engineered copolymers for enhanced removal of metal during CMP of semiconductor substrates. *See* Weinstein, column 1 at lines 57-59. The engineered polymers have a more hydrophilic moiety and a less hydrophilic moiety. The first moiety of the engineered copolymer molecules of this invention will typically align or otherwise forms bonds (preferably coordinate covalent bonds) with the substrate surface. Depending upon the embodiment selected, the second moiety of the engineered copolymer molecules often provides structural rigidity to the engineered copolymer molecules and can also

enable interaction of the engineered copolymer molecules with the polishing pad surface. Of the hundreds of monomers and combinations of monomers discussed by Weinstein, at column 6 lines 21-31 Weinstein mentions several sulfonic acids. The text in Weinstein reads as follows:

The engineered copolymer for use in this invention can also be derived from a monomer with an unsaturated sulfonic acid monomer selected from one or more of 2-acrylamido-2-methyl-1-propanesulfonic acid, 2-methacrylamido-2-methyl-1-propanesulfonic acid, 3-methacrylamido-2-hydroxy-1-propanesulfonic acid, allylsulfonic acid, allyloxybenzenesulfonic acid, 2-hydroxy-3-(2-propenyloxy)propanesulfonic acid, 2-methyl-2-propene-1-sulfonic acid, styrene sulfonic acid, vinyl sulfonic acid, 3-sulfopropyl acrylate, 3-sulfopropyl methacrylate and water-soluble salts thereof.

It is important to note that the above compounds are not included in the composition of Weinstein, but rather copolymers having a variety of monomeric building blocks including any of those listed above are included. Claim 1 as amended recites a single ring structure.

The Examiner contends Tran discloses that sulfonic acid comprises acid moiety substituted onto a carbon ring structure, and a polar moiety substituted on the ring structure in an ortho position from the sulfonate moiety. Tran discloses at column 3 lines 25-49 :

complexing agents ... having at least two acid moieties present in the structure, which can affect complexation to the target metal, such as copper. These include, but are not limited to, carboxyl, carboxylate, hydroxyl, sulfonic and phosphonic groups. Carboxylate and hydroxyl groups are preferred Particularly effective are structures which possess two or more carboxylate groups with hydroxyl groups in an alpha position, such as straight chain mono- and di-carboxylic acids and salts including, for example, malic acid and malates, tartaric acid and tartarates and gluconic acid and gluconates. Also effective are tri- and polycarboxylic acids and salts with secondary or tertiary hydroxyl groups in an alpha position relative to a carboxylic group such as citric acid and citrates. Also effective are compounds containing a benzene ring such as ortho, di- and polyhydroxybenzoic acids and acid salts, phthalic acid and acid salts,

pyrocatecol, pyrogallol, gallic acid and gallates and tannic acid and tannates. The most preferred complexing agents of the present invention will tend to complex with metal anions, forming a 5 or 6 member ring, whereby the metal atom forms a portion of the ring.

Later Tran also states:

Also effective complexing agents are tri- and polycarboxylic acids and salts with secondary or tertiary hydroxyl groups in an alpha position relative to a carboxylic group such as citric acid and citrates. Also effective complexing agents are compounds containing a benzene ring such as ortho di- and polyhydroxybenzoic acids and acid salts, phthalic acid and acid salts, pyrocatecol, pyrogallol, gallic acid and gallates and tannic acid and tannates.

No where does Tran disclose a sulfonate-containing oxidizer. Indeed, contrary to the Examiner's assertion, no where does Tran disclose a benzene ring structure having a sulfonate in an alpha position with another polar moiety. Tran only discloses carboxylate groups with hydroxyl groups in an alpha position, e.g., only ortho, di and polyhydroxybenzioc acid – a benzene ring having a carboxylate and an hydroxy in the ortho position.

The Examiner apparently is asserting that one of skill in the art would know to substitute a sulfonate in place of a carboxylate in Tran's chelators having a polar moiety in an alpha or beta position (despite there being no motivation in Tran to do so), and then to substitute the chelating agents of Tran into the composition of Weinstein. In fact, there is no motivation for such a substitution and no chance of success, because Weinstein does not have these components in his slurry. Weinstein only has engineered copolymers made up of monomeric polymerizable substituents. The list in Weinstein contains only one ring structure having a sulfonate group – allyloxybenzene sulfonic acid – a benzene ring structure having a sulfonate group and an –O-CH₂-CH=CH₂ group substituted thereon. The alkene functionality provides the polymerizable function. None of the structures shown by Tran can be polymerized, so why would Weinstein add them when the chance of success in preparing his engineered copolymer is zero? As Tran does not in fact disclose a sulfonate moiety attached to a carbon atom in a ring having a polar substituent substituted in the ortho or meta position, and as there is no motivation to use the

compounds in Tran to make the copolymer of Weinstein (and no chance of success should one so try), Applicants respectfully request that this rejection be reconsidered and withdrawn.

Additionally, with respect to new dependent claim 17, reciting that the polishing composition is substantially free of additional oxidizers, Tran at column 2 lines 33-38 also requires oxidizing agents, stating at column 3 line 61 to column 4 line 12 that:

Useful oxidizing agents ... include any water-soluble composition capable of receiving an electron from the metal atoms at the surface of the substrate during the polishing operation. ... Preferred oxidizing agents would generally include iodates. Oxidizing agents in compositions of the present invention may be comprised of nitrates, iodates, perchlorates, sulfates, peroxides, or any other commonly known oxidizing agent.

Similarly, Weinstein discloses use of oxidizing agent in for example column 7 at lines 49-56. As new dependent claim 17 is free of additional oxidizers, this new claim is further distinguishable from Weinstein and Tran, alone or in combination. Applicant's believe the Examiner is aware of the patentability of new claim 17, as similar claim 9 is indicated as containing patentable subject matter.

The Examiner further combines Weinstein and Tran with Antonell (USP 6,899,596) to reject claims 2-8 and 10-11. Antonell does not remedy the deficiency of Weinstein and Tran, alone or in combination. The Examiner contends that Antonell discloses a CMP method having benzene having a dipole moment of less than 1.4. Antonell discloses a CMP slurry for tungsten where the CMP slurry comprises water, an abrasive, an oxidizing agent, and a solute having a polarity less than that of water. See Antonell, Abstract. Antonell does state at column 2, lines 10-14, that the "primary carrier constituent may be water and the polarity-influencing constituent may be a material having a polarity less than that of water, for example having a dipole moment less than 1.8. The polarity-influencing constituent may be benzene." Antonell does disclose the dipole moments of various compounds, including benzene which has a dipole moment polarity of zero. This list is random – it contains "water 1.85; methanol 1.70; ethanol 1.69; 1-propanol 1.68; 1-butanol 1.66; formic acid 1.41; acetic acid 1.74; formamide 3.73; acetone 2.88; methyl ethyl ketone 1.78; acetonitrile 3.92; N,N-dimethylformamide 3.82; diemthyl sulfoxide 3.96; hexane 2.02; benzene 0; diethyl ether 1.15; tetrahydrofuran 1.63; methylene chloride 1.60; and carbon tetrachloride 0." Antonell discloses generally a solvent having a dipole moment less than

1.8, 1.6, 1.4, or substantially non-polar having a dipole moment of less than 1.0. But the dipole moment is not believed to be related to the oxidizing potential of the compound, which seems to be what the Examiner is contending on page 3-4 of the Office Action. Additionally, Antonell prefers lower dipole moments, and with respect to polar-moiety-substituted benzenes, the lowest dipole moment can be found in para-substituted benzenes.

As Tran does not in fact disclose a sulfonate moiety attached to a carbon atom in a ring having a polar substituent substituted in the ortho or meta position, and as there is no motivation to use the compounds in Tran to make the copolymer of Weinstein (and no chance of success should one so try), and as Antonell does not remedy the deficiencies of Tran and Weinstein alone or in combination, Applicants respectfully request that this rejection be reconsidered and withdrawn.

Claims 14-16 stand rejected as being obvious over Minamihaba (USP 6,858,539) in view of Tran (USP 6,602,112) and further in view of Tseng (USP 6,455,428).

Claim 14 is a method of post CMP cleaning using a “fluid cleaning composition comprising an organosulfonic acid oxidizer, said organosulfonic acid oxidizer having a ring structure comprising carbon, a sulfonate moiety substituted onto a carbon atom in the ring structure, and a polar moiety substituted onto the ring on an ortho position or a meta position from the sulfonate moiety.” In contrast, Minamihaba discloses a post-CMP cleaning fluid comprising dodecylbenzene sulphonate. As can be appreciated by one of skill in the art, the benzene sulfonic acid compound of Minamihaba has a C12 alkyl group attached in the ortho position to the sulfonate, and this C12 alkyl group is about as non-polar as a moiety can be. Further, Minamihaba at column 4 lines 19-28 discloses that the dodecylbenzene sulphonate is a surfactant.

It is commonly known in the field of chemistry that a surfactant must comprise a polar section (e.g., a sulfonate moiety) and a non-polar section (e.g., a long chain alkyl moiety).

The Examiner then contends that Tran teaches in his method of CMP the use of a compound having a ring structure, a sulfonate moiety substituted onto a carbon in the ring structure, and a (polar) moiety substituted onto the ring in an ortho position. Again, as discussed above, Tran teaches a compound having at least two acid groups on a structure, where the acid groups he describes are polar moieties and include sulfonates. Tran teaches that “particularly effective complexing agents of the present invention have a structure that possesses one or more

carboxylate groups with hydroxyl groups in an alpha position, such as straight chain mono- and di-carboxylic acids a polar group in the ortho position.” Conspicuously absent in the previous quote is any mention of a general ring structure having an acid which can include sulphonic acid and a polar group on an ortho site. Tran remedies this by stating “Also effective are compounds containing a benzene ring such as ortho, di- and polyhydroxybenzoic acids and acid salts, phthalic acid and acid salts, pyrocatecol, pyrogallol, gallic acid and gallates and tannic acid and tannates.” While Tran discloses benzene rings with a carboxylic acid moiety, conspicuously absent in the above quote is a benzene ring having a sulfonic acid moiety.

Tseng is used to provide disclosure of a method for cleaning.

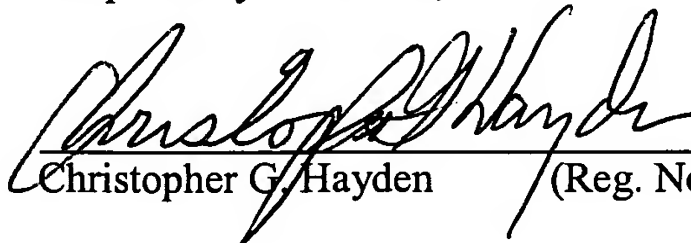
There is no motivation to provide a chelating agent of Tran in for the surfactant of Minamihaba. The compounds have completely different structures and functions. Further, tran as discussed above does not teach a compound having a ring structure, a sulfonic acid moiety, and a polar moiety in the ortho or para position. Tseng does not remedy the deficiencies of Tran and Minamihaba alone or in combination. For these reasons, Applicants respectfully request that this rejection be reconsidered and withdrawn.

Claim 16 is similar to claim 14, but the method is directed to cleaning resist as opposed to CMP residue. For the same reasons, Applicants respectfully request that this rejection be reconsidered and withdrawn.

No fee is believed due for the submission of this Response. Please charge the required fee to **Morgan, Lewis & Bockius LLP** Deposit Account No. 50-0310. A duplicate of this authorization is attached for the Finance Branch.

Respectfully submitted,

Date November 14, 2005
(filed after weekend due date)


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